

Applicant : Murakami et al.
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Amendments to the Claims:

This listing of claims replaces all listings of claims in the application:

Listing of Claims:

1-25. (Canceled)

26. (Currently amended) An energy tracking system for a fleet of battery powered vehicles, comprising:

a plurality of sensors, each sensor being installed on a respective vehicle in the fleet for sensing a state of charge of at least one battery on the vehicle;

a plurality of vehicle subsystems, each vehicle subsystem being installed in a respective vehicle in the fleet, operatively coupled to a corresponding sensor, and configured to transmit information reflecting the state of charge of the at least one battery; and

a central station in wireless communication with said plurality of vehicle subsystems and configured to allocate vehicles in the fleet in response to the information regarding the state of charge of the at least one battery to effectuate an efficient battery charging operation in the fleet, wherein allocating vehicles to effectuate an efficient battery charging operation in the fleet comprises allocating a vehicle with a state of charge corresponding to a non-linear charging rate if such a vehicle is available, otherwise allocating a vehicle with a state of charge corresponding to a linear charging rate.

27. (Previously presented) The energy tracking system of claim 26, wherein said central station is configured to allocate the vehicle having a highest state of charge.

28. (Currently amended) The energy tracking system of claim 26, wherein said central station is configured to reserve a vehicle having a highest state of charge for a user

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request above a predetermined traveling distance, thereby making said reserved vehicle otherwise unavailable and allocate a vehicle having a second highest state of charge to a user request below the predetermined traveling distance.

29. (Currently amended) The energy tracking system of claim 26, wherein said central station is configured to reserve a group of vehicles having highest states of charge for a plurality of user requests above a predetermined traveling distance, thereby making said reserved vehicle otherwise unavailable to allocate a vehicle having a highest state of charge outside the group of vehicles to a user request below the predetermined traveling distance.

30. (Currently amended) The energy tracking system of claim 29, wherein said central station is further configured to adjust[[ing]] a number of vehicles in the group of vehicles in response to a varying demand of the user requests above the predetermined traveling distance.

31. (Previously presented) The energy tracking system of claim 26, wherein:
said central station is configured to transmit a first signal to a vehicle in response to the state of charge of the vehicle being less than a predefined minimum value; and
said vehicle subsystem is further programmed to display a low state of charge message in response to the first signal.

32-34. (Canceled)

35. (Currently amended) A battery powered vehicle sharing system including a fleet of vehicles and a plurality of ports, comprising:

a sensor installed on each vehicle in the fleet for sensing a state of charge of the vehicle;
a vehicle subsystem installed on each vehicle in the fleet and operatively coupled to the sensor on the vehicle for transmitting state of charge information corresponding to the state of charge sensed by the sensor; and
a central station including:

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a tracking system that provides vehicle location information corresponding to a location of each vehicle; and

a computer system programmed to select and allocate vehicles to users based on the state of charge information and the vehicle location information to effectuate an overall efficient battery charging operation in the fleet of vehicles, wherein allocating vehicles to effectuate an overall efficient battery charging operation in the fleet comprises allocating a vehicle with a state of charge corresponding to a non-linear charging rate if such a vehicle is available, otherwise allocating a vehicle with a state of charge corresponding to a linear charging rate.

36. (Previously presented) The battery powered vehicle sharing system of claim 35, wherein said computer system is further programmed to define a vehicle search group for each port in which one or more vehicles from the fleet may be present at any given time and to select and allocate, for a user at a given port, a vehicle having a highest state of charge from the vehicle search group defined for that port.

37. (Previously presented) A battery powered vehicle sharing system including a plurality of ports and a fleet of vehicles with each vehicle having a state of charge, comprising:

a sensor associated with and installed on each vehicle in the fleet for sensing the state of charge of the associated vehicle;

a vehicle subsystem including a wireless communication unit associated with and installed on each vehicle in the fleet and operatively coupled to the sensor on the associated vehicle for transmitting state of charge information corresponding to the state of charge sensed by the sensor; and

a central station coupled in wireless communication with said wireless communication units, including a tracking system that provides vehicle location information corresponding to the location of each vehicle and a computer system for processing the state of charge information and the vehicle location information, said computer system being programmed to:

provide an estimated time of arrival of each vehicle at a port;

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define a vehicle search group for each port including vehicles present or having an estimated time of arrival within a predefined time period at the port; and

select and allocate a vehicle for a user at a given port from the vehicle search group defined for that port.

38. (Previously presented) A battery powered vehicle sharing system including a fleet of vehicles with each vehicle having a state of charge and a plurality of ports with each port having a charging facility for selectively coupling to a vehicle to increase the state of charge thereof over a charging time period, comprising:

a sensor associated with and installed on each vehicle in the fleet for sensing the state of charge of the associated vehicle;

a vehicle subsystem including a wireless communication unit associated with and installed on each vehicle in the fleet and operatively coupled to said sensor on the associated vehicle for transmitting state of charge information; and

a central station coupled in wireless communication with said wireless communication units, including a tracking system that provides vehicle location information and a computer system for processing the state of charge information and the vehicle location information, said computer system being programmed to:

include a vehicle in a vehicle search group of a given port if the vehicle is located at a charging facility at the port and has a charging time period which is due to expire within a predefined time period; and

select and allocate a vehicle for a user at a given port from the vehicle search group defined for that port.

39. (Previously presented) The battery powered vehicle sharing system of claim 35, wherein:

each port includes a charging facility for selectively coupling to a vehicle to increase the state of charge of the vehicle; and

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said computer system is programmed to select a vehicle located at a given port for coupling to the charging facility at that port, based on the state of charge information for the vehicle.

40. (Previously presented) The battery powered vehicle sharing system of claim 35, wherein:

each port includes a charging facility for selectively coupling to a vehicle to increase the state of charge of the vehicle; and

said computer system is programmed to determine an charging order for a plurality of vehicles located at a port based on the state of charge of each vehicle in the plurality of vehicles.

41. (Previously presented) A battery powered vehicle sharing system including a fleet of vehicles with each vehicle having a state of charge and a plurality of ports with each port having a charging facility for selectively coupling to a vehicle to increase the state of charge thereof over a charging time period, comprising:

a sensor associated with and installed on each vehicle in the fleet for sensing the state of charge of the associated vehicle;

a vehicle subsystem including a wireless communication unit associated with and installed on each vehicle in the fleet and operatively coupled to the sensor on the associated vehicle for transmitting state of charge information; and

a central station coupled in wireless communication with said wireless communication units, including a tracking system that provides vehicle location information and a computer system for processing the state of charge information and the vehicle location information, said computer system being programmed to:

determine a charging order for a plurality of vehicles located at a port based on an order of the state of charge of the vehicles, from the lowest state of charge to the highest state of charge; and

select and allocate vehicles to users based on the state of charge information and the vehicle location information.

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42. (Previously presented) The battery powered vehicle sharing system of claim 40, wherein:

said charging facility defines a charging rate for each vehicle, a plot of the charging rate including a generally linear region below a first state of charge level and a generally nonlinear region above the first state of charge level; and

said computer system is programmed to assign a vehicle to a charging facility in response to the state of charge of the vehicle below the first state of charge level.

43. (Currently amended) A method for tracking charging state in a battery powered vehicle sharing system, comprising:

sensing a state of charge of each vehicle in the vehicle sharing system;

transmitting state of charge information to a central station;

processing the state of charge information at the central station; and

in response to a user request at a vehicle port, allocating a vehicle available at the vehicle port to effectuate an efficient charging operation of the vehicle sharing system, wherein allocating a vehicle to effectuate an efficient charging operation of the vehicle sharing system comprises allocating a vehicle with a state of charge corresponding to a non-linear charging rate if such a vehicle is available, otherwise allocating a vehicle with a state of charge corresponding to a linear charging rate.

44. (Previously presented) The method of claim 43, wherein allocating a vehicle includes allocating the vehicle having a highest state of charge available at the vehicle port.

45. (Previously presented) The method of claim 43, wherein allocating a vehicle includes:

reserving a vehicle having a highest state of charge available at the vehicle port for a user request having a traveling distance above a predetermined value; and

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allocating a vehicle having a second highest state of charge available at the vehicle port to a user request having a traveling distance below the predetermined value.

46. (Previously presented) The method of claim 43, wherein allocating a vehicle includes:

reserving a group of vehicles having highest states of charge available at the vehicle port for user requests having traveling distances above a predetermined value; and

allocating a vehicle having a highest state of charge outside the group available at the vehicle port to a user request having a traveling distance below the predetermined value.

47. (Canceled)

48. (Previously presented) The method of claim 46, further comprising adjusting a number of vehicles in the group of vehicles in response to a varying demand of the user requests having the traveling distances above the predetermined value.

49. (Previously presented) The method of claim 43, further comprising including a vehicle due to arrive at a vehicle port within a predefined time period in the vehicles available at the vehicle port; and

including a vehicle charging at the vehicle port in the vehicles available at the vehicle port in response to a charging time of the vehicle due to expire within the predefined time period.

50 (New) The energy tracking system of claim 26, wherein a vehicle is available if a vehicle is located at a vehicle port.

51 (New) The energy tracking system of claim 26, wherein a vehicle is available if a vehicle is due to arrive at a vehicle port within a predefined time period.

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52 (New) The energy tracking system of claim 26, wherein a vehicle is available if a vehicle is due to arrive at a vehicle port within a predefined time period.

53 (New) The energy tracking system of claim 26, wherein a vehicle is available if a vehicle charging at a vehicle port has a charging time due to expire within a predefined time period.

54 (New) The battery powered vehicle sharing system of claim 35, wherein said computer system is further programmed to define a vehicle search group for each port in which one or more vehicles from the fleet may be present at any given time.

55 (New) The battery powered vehicle sharing system of claim 54, wherein a vehicle is included in a first vehicle search group if a vehicle is located at a port corresponding to the first vehicle search group.